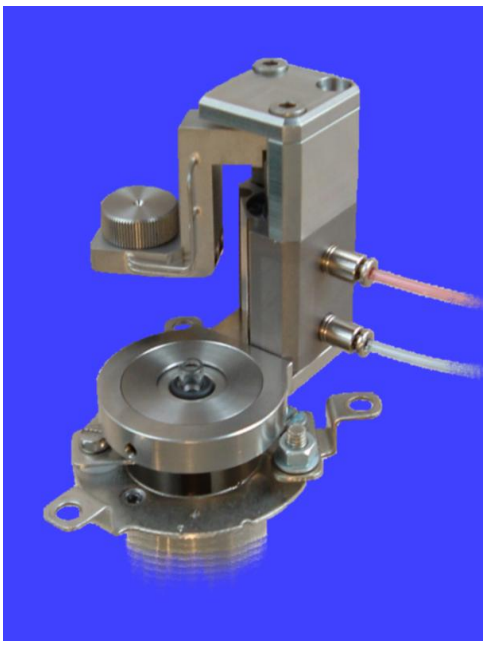
ATAS GL
GL Sciences Company

# LINEX

Liner Exchanger



## User's Guide

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# CE Declaration of Conformity

| | |
|---|---|
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| Model: | LINEX |
| Type of Equipment: | OPTIC Injector Liner Exchanger |
| Council Directives: | 98/37/EEC Directive as last amended by EC 89/392/EEC (Machinery Directive) |
| Product Examined to: | EN 1050 |

ATAS GL International B.V. hereby declares under our sole responsibility that our LINEX – OPTIC Injector Liner Exchanger when installed in accordance with installation specifications is in conformity with the above Directives and Standards:

N. Gribov
R&D Manager

Date: November 24, 2004

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# 1. Warnings

This section explains the warnings and cautions that should be observed when installing or operating LINEX and its options.

The safety information is covered at the relevant points throughout the manual. Please, read this manual in its entirety before installing or operating the instrument. Should any point remain unclear, contact your supplier for assistance before proceeding.

LINEX is designed for installation and use in a laboratory environment by suitably trained personnel. All relevant safety aspects should be assessed in accordance with the local regulations before installing and commissioning the instrument.

**LINEX is intended for use in appropriately equipped chemical analysis laboratories. In particular, provision must be made for the storage of solvents in flameproof cabinets and personnel must wear protective clothing and eye protection at all times.**

**OPTIC 3, host GC and FOCUS autosampler should be disconnected from the mains power supply until installation of LINEX is complete.**

**The operation of the OPTIC 3 injector requires that it heats rapidly to high temperatures. Parts of the injector may remain hot for some time after the unit is switched off. Care must be taken when working in the area of the injector. It is especially important to ensure that the injector is cool (below 40°C) and switched off before LINEX mounting is started.**

**When Installing LINEX, make sure that there is no cable connected between the FOCUS' (CombiPAL) "Interface 1" port and GC. It can disrupt the hardware communication between OPTIC 3 and autosampler and damage the electronic board.**

# 2. Introduction

LINEX is a GC injector liner exchanger designed to extend the capabilities of the OPTIC 3 injection system for the analysis of gas, matrix containing liquid and solid state samples. LINEX can be delivered in one of the two configurations: LINEX-DMI and LINEX-TD. LINEX-DMI version is made to enable the in-injector analysis of liquid samples containing heavy non-volatile or non-evaporating matrix. LINEX-TD configuration is designed for a direct (in-injector) thermal desorption of solid and enriched gaseous samples.

LINEX can be quickly, in a matter of minutes, mounted on ANY standard OPTIC injector. ANY of the standard OPTIC liners can be handled by LINEX either in manual or automated mode. In the automated mode liners are transported between the liner tray and injector by ATAS GL FOCUS (CTC CombiPAL) sampling robot equipped with a pneumatic gripping arm. This gripping arm requires that the robot should have a slit in the injection unit.

With LINEX, the multi-sample analysis sequence works in a simple way: head of the injector is automatically opened and an empty liner or a liner containing sample is introduced into the injector. The head is closed and the injector is purged with the carrier gas. Next, the sample is injected (if it is not in the liner yet), the injector is heated and the sample is transferred directly onto the column. At the end of analysis the used liner is moved back to the liner tray and the cycle is repeated.

The LINEX option - Capping-De-Capping Station – enables the automated handling of the capped OPTIC liners. With this option, the capped liner, which contains earlier prepared or collected sample or has been conditioned to make it clean, can be automatically de-capped just before it is loaded into the GC injection port.

# 3. How to Use this Guide

This manual contains information on how to operate and install the LINEX and its options. The main part contains information, which you are likely to refer to regularly. Information, which is only occasionally referred to, is included in the appendixes.

Section 4 describes the LINEX hardware and section 5 lists its technical specification parameters.

Users who install the LINEX and its software should refer to the sections 6, and 8 for description and installation procedures.

Section 7 describes the LINEX option - Capping-De-Capping Station. This is the add-on to LINEX enabling automated handling of the capped OPTIC liners.

Section 10 is intended for the frequent LINEX users or users who are experienced in using ATAS GL equipment. It describes how to operate LINEX.

***NOTE!*** *The LINEX should be installed and set up before the operating instructions are used.*

The instructions in the sections 11 and 12 describe how to troubleshoot and diagnose the problems with the LINEX and its options.

The appendixes provide useful information such as Control Cable description, Pneumatic Flow Diagram, Accessories, Consumables, Spares lists etc.

# 4. LINEX Hardware Overview

The LINEX hardware consists of the injector head, the liner gripper, the pneumatic control box and the liner tray.

## 4.1 Injector Head

The LINEX injector head is a pneumatically actuated mechanical device designed to open and close the injector in order to exchange the liners (Fig. 4.1). It is mounted on the injector instead of the standard top boss assembly. The head retains such important properties of the standard injector top boss as:

- Sealing the injector up to 500 kPa
- Septum purge
- Possibility to perform liquid injections either manually or using FOCUS autosampler
- Compatibility with Merlin MicroSeal

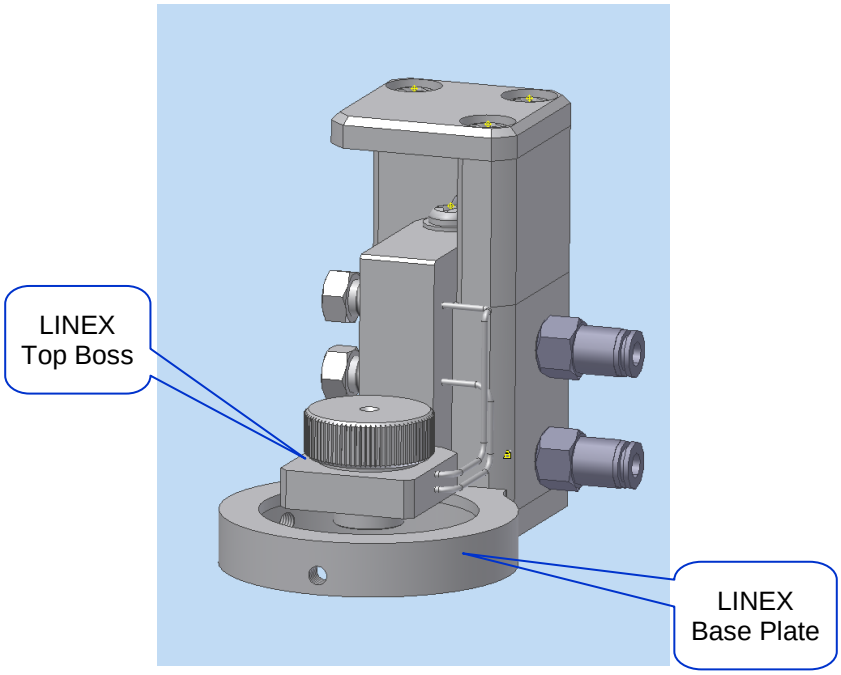



Figure 4.1 The LINEX head

## 4.2 Liner Gripper

In order to transport the liners, the standard FOCUS autosampler (CombiPAL) is equipped with a pneumatic gripper (Fig. 4.2). It is mounted on the FOCUS injection unit without its modification.

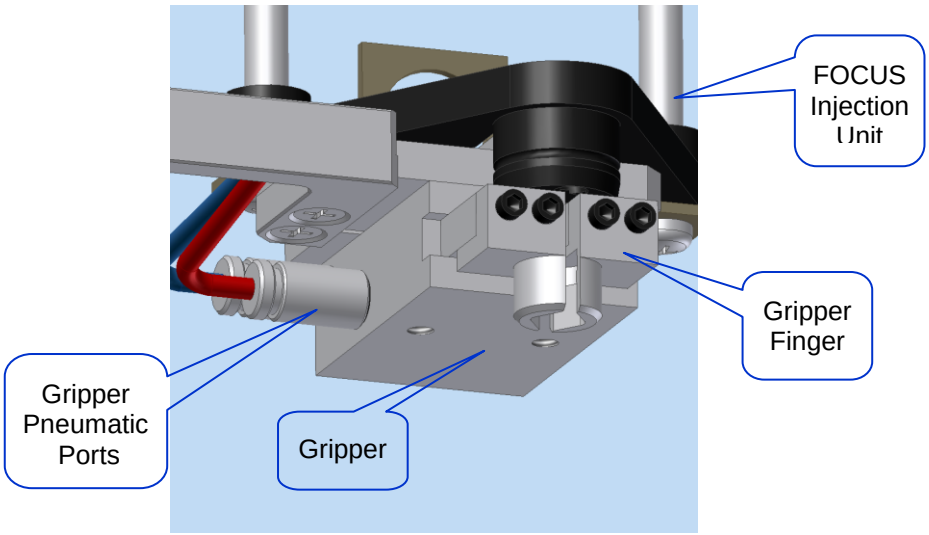



Figure 4.2 The Pneumatic liner gripper on the FOCUS injection unit

## 4.3 Pneumatic Control Box

The LINEX injector head and gripper are controlled via the pneumatic control box mounted onto the FOCUS horizontal X-Crossrail. The following pneumatic and electrical connections are available on the front and rear panels of the box (Fig. 4.3 and 4.4):

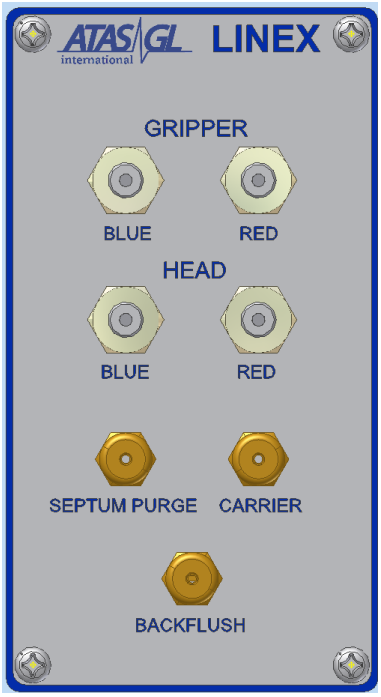



Figure 4.3 Front panel of the LINEX pneumatic control box

## FRONT PANEL:

***Gripper***

"Blue" and "Red" quick connection ports are used to connect compressed air lines to the liner gripper.

***Head***

"Blue" and "Red" quick connection ports are used to connect compressed air lines to the LINEX injector head.

***Carrier***

1/16" Swagelok type connection used to connect carrier gas to the injector.

***Septum Purge***

1/16" Swagelok type connection used to connect the septum purge line of the injector.

***Backflush***

1/16" Swagelok type connection used to connect the backflush line of the injector. It is needed when the backflush option is used.

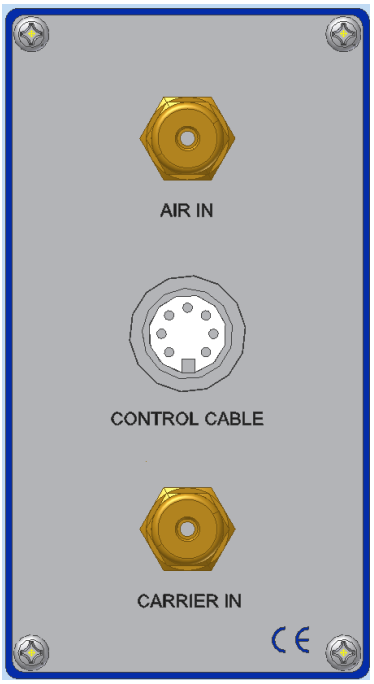



Figure 4.4 Rear panel of the LINEX pneumatic control box

**REAR PANEL:**

***Air In***

1/8" Swagelok type connection used to connect the compressed air gas supply needed for the actuation of the LINEX head and gripper. Advised compressed air pressure supply is 5 bars.

***Control Cable***

Connection used to connect the control cable from FOCUS and OPTIC.

***Carrier In***

1/8" Swagelok type connection used to connect the carrier gas supply to the OPTIC injector.

## 4.4 Liner Tray

There are two types of LINEX liner trays available. They both are compatible with the FOCUS autosampler. Standard LINEX tray that is always supplied with the LINEX can accommodate up to 98 OPTIC liners. It is mounted on the standard FOCUS tray holder. The 28-position narrow tray is supplied as an option.

# 5. Technical specifications

## 5.1 General

- Ambient temperature range: 10 - 40°C
- Ambient operating humidity: 5 - 90%
- Compatible with FOCUS (CombiPAL) autosampler. **The autosampler should have a slit in the injection unit.**
- Compatible with any standard OPTIC liner (5 mm OD)
- Liner tray capacity: 28- or 98-positions
- Conforms to safety standards:
  The European Machine Safety Directive 98/37/EEC,
  The Electromagnetic Compatibility Directive 89/336/EEC

## 5.2 Head

- Pneumatically operated. Requires 5 bars stable, oil-free, compressed air supply
- Compatible with any standard OPTIC injector
- Maximum operating injector pressure: up to 500 kPa
- Integrated septum purge line
- Compatible with Merlin MicroSeal septum
- Allows liquid injection with the FOCUS autosampler. The 70 mm syringe needle is required

## 5.3 Gripper

- Mounted on FOCUS Injection Unit
- Pneumatically operated. Requires 5 bars stable, oil-free, compressed air supply

## 5.4 Software

- Based on CTC PAL Cycle Composer

## 5.5 Capping-De-Capping Station (option)

- Mounted on FOCUS X-rail
- Pneumatically operated. Requires 5 bars compressed air supply
- Compatible with OPTIC liners capped with ATAS GL PTFE liner caps
- Liner tray capacity: 28- or 98-positions for capped liners

# 6. Hardware Installation

This section should be read carefully in conjunction with any specific instructions supplied with the kit. Please follow these instructions with particular care if you are installing the LINEX on the OPTIC injector. Do not hesitate to contact the supplier should you have any questions.

The ATAS GL LINEX unit is designed to work with the ATAS GL OPTIC 3 injector and ATAS GL FOCUS robotic system. OPTIC 3 and FOCUS should be installed prior to the LINEX unit. Please, refer to the manuals of these instruments for installation.

***NOTES:***

1. ***The injector should be mounted in the front position of the GC.***
2. ***The FOCUS autosampler should be equipped with the Injection Unit having a slit in the left side wall.***

The installation of LINEX can be divided into the following steps:

- LINEX Head installation
- LINEX Gripper installation
- Mounting the pneumatic control box and performing all the required pneumatic and electrical connections
- Liner Tray installation

## 6.1 Unpacking LINEX Kit

LINEX-DMI and LINEX-TD kits are shipped in a box. The box should contain the following items:

| Pos. | Item |
|---|---|
| 1 | LINEX Head Kit |
| 2 | LINEX Gripper Kit |
| 3 | LINEX Pneumatic Control Box |
| 4 | LINEX 28-position Liner Tray Assembly |
| 5 | Control Cable |
| 6 | LINEX User's Guide |
| 7 | CD with Macros and Objects |
| 8 | LINEX Standard Kit |
| 9 | Pack of OPTIC Liners* |

* LINEX-DMI is supplied with a LINEX-DMI compatible liners and needle guides and LINEX-TD contains a pack of the fritted liners (p/no A100001).

## 6.2 Installing the Head

**WARNING: It is important that OPTIC 3, the host GC and FOCUS are switched off until the installation is complete.**

Depending on the type of GC and the installation of the OPTIC injector, you will need to modify the lift-off cover of the GC to properly accommodate the LINEX head. The modification procedure is described in the installation manual supplied with the unit. Before installation, check that the minimum required Y-axis distance from the FOCUS Injection Unit to the OPTIC injector is 50 mm. This can be seen on the Control Terminal of the FOCUS (refer to the PAL System User Manual). To check it via FOCUS Control Terminal, go to Menu → Setup → Objects → Injectors → OPTIC → position Y.

Install the LINEX head following the steps:

1. Unscrew the original Top Clamp Nut of the OPTIC injector and remove it carefully. Remove the Top Boss Insulator (white Teflon ring).

2. Screw the LINEX Mounting Nut onto the injector (Fig. 6.1). Remove the liner from the injector.

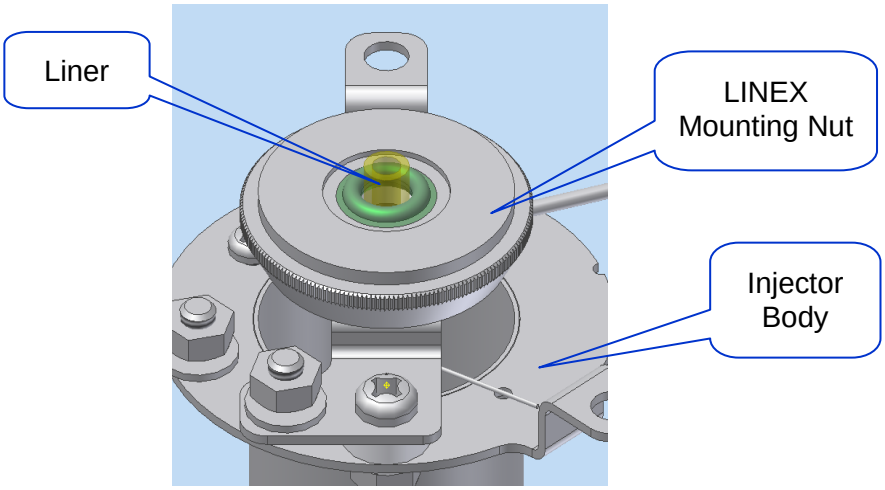



Figure 6.1 The LINEX mounting nut on injector

3. Place the LINEX head on the mounting nut with the cylinder to the front of the GC. Make sure that the hexagon socket screws in the LINEX base ring are in place.

4. Tight all the three hexagon screws to secure the head on the injector (Fig. 6.2). Use 1.5 mm hex screw key supplied with the LINEX unit.

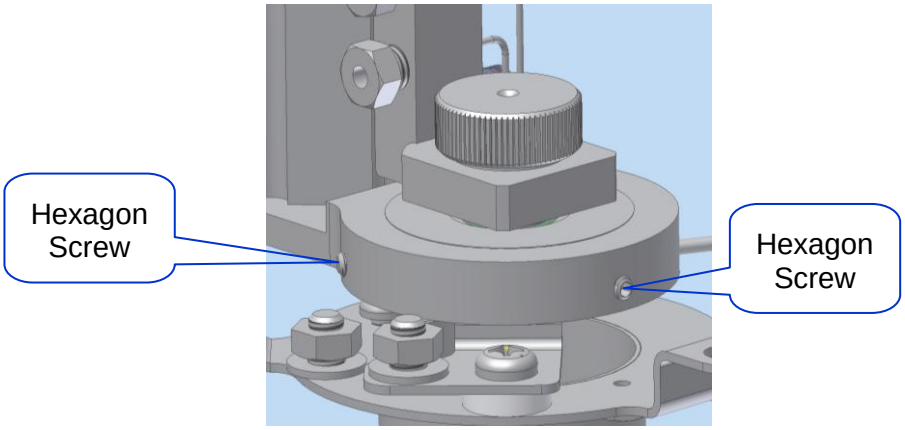



Figure 6.2 Fixing the LINEX head on the injector

## 6.3 Installing Gripper

The liner gripper is installed onto the FOCUS injection unit. The gripper assembly is simply clamped onto the steel plate at the bottom of the injection unit by means of the wedged sliding mounting brackets (Fig. 6.3). In order to retain the FOCUS functionality, it is very important that the gripper is positioned very precisely on the plate. For this, some preparation work might be required.

To install the gripper, follow the steps:

1. Remove the white plastic plate screwed to the backside of the FOCUS Z-Crossrail (behind injection unit).

***NOTE:*** ***To be able to work with the Agitator without white plastic plate, replace the agitator lead bracket with the "FOCUS Agitator Lead Bracket" (p/no L200018), which is always supplied with the LINEX standard kit.***

2. Take the gripper assembly and fit it onto the FOCUS injection unit, as it is shown in Fig. 6.3. If the bended-up tale of the steel plate does not fit into the groove of the gripper-mounting bracket, file out the corners of the plate a bit.

3. Tight the screw holding the gripper mounting brackets together (Fig. 6.3). Use the hexagon screw key supplied with the kit.

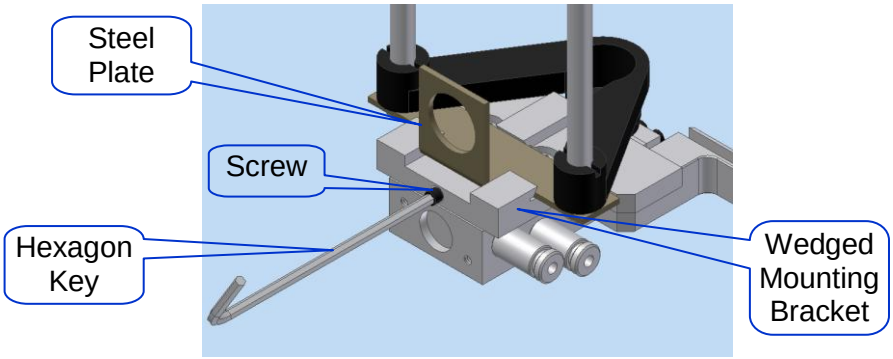


Figure 6.3 Installing gripper onto the FOCUS injection unit

## 6.4 Pneumatic and Electrical Connections

The LINEX is controlled via the pneumatic control box. A compressed air supply is required for actuating the LINEX head and gripper. The required pressure should be in the range of 5 to 7 bars. To ensure normal operation of the LINEX head and gripper, it is strongly advised to use a separate compressed air supply.

1. Mount the pneumatic control box onto the FOCUS X-Crossrail.

    a) Loosen the Torx screw on the pneumatic box mounting bracket.

    b) Attach the box to the left end of the X-Crossrail, fitting the mounting clamp teeth into the grooves on the bottom of the X-Crossrail.

    c) Make sure that the clamp fits completely into the groove. Tight the Torx screw until the mounting clamp is firmly in place.

2. Connect the carrier and septum purge lines to the LINEX head.

    a) Locate the PEEK tubing assembly (p/no L400009).

    b) Connect the blue-marked end of the tubing with the pre-mounted 1/16" Swagelok nut to the "Carrier" port on the front panel of the pneumatic control box. Connect the opposite blue-marked end to the lower connection port on the LINEX head (see Fig. 6.4).

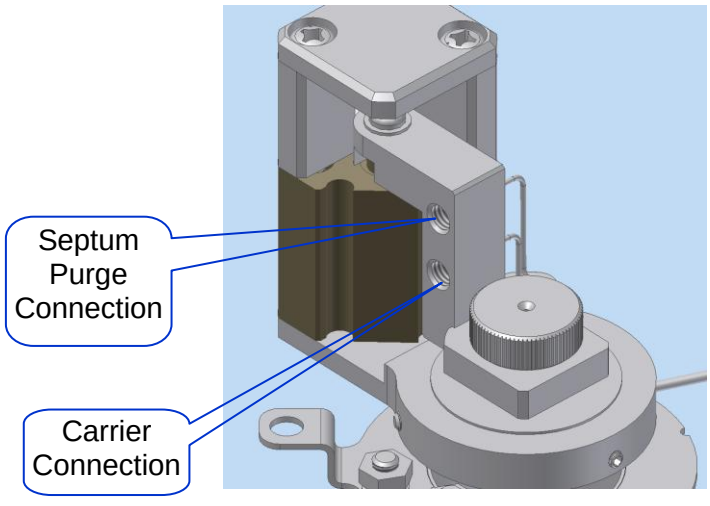



Figure 6.4 Carrier and Septum Purge connections to the LINEX head

    c) Connect the "Septum Purge" port of the pneumatic control box with the LINEX head using the second line of the PEEK tubing subassembly.

    d) Connect compressed air supply lines to the LINEX head. Use the polyurethane tubing assembly (p/no L400008) to connect the Head

"Blue" and "Red" ports on the front panel of the pneumatic control box to the pneumatic ports on the LINEX head (see Fig. 6.5).

***NOTE:*** ***The LINEX head is always closed in the OPTIC standby state. If due to some reason this is not the case, sweep the blue and red tubing's on the head side.***

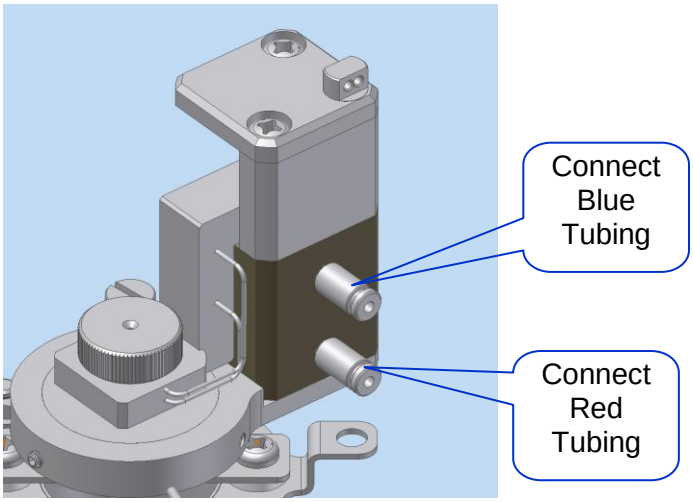



Figure 6.5 Compressed air connections to the LINEX head

3. Connect the compressed air supply to gripper. Use the polyurethane tubing assembly reinforced with a stainless steel support wire supplied with the kit.

   a) Normally, the connections on the gripper side are done at the factory. If this not the case, fix one end of the support wire to the gripper mounting bracket as it is shown in the Fig. 6.6.

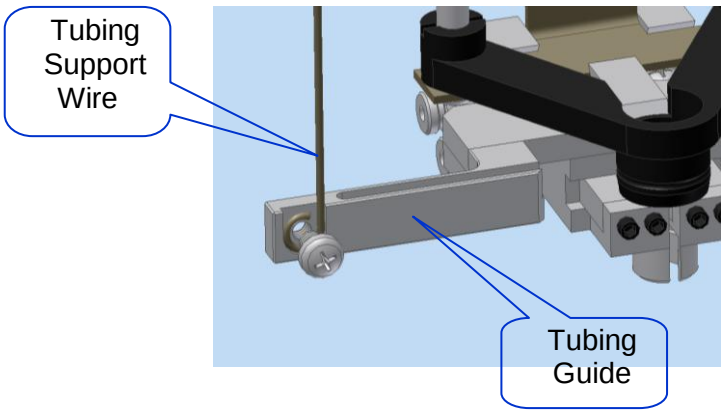



Figure 6.6 Fixing the support wire to the gripper mounting bracket

   b) Guide the polyurethane tubing's at the gripper side into a groove of the tubing guide bracket (Fig. 6.6).

   c) Fix the opposite end of the wire/tubing assembly to the left side cover of the FOCUS X-Crossrail, using the plastic clips supplied with the kit (Fig. 6.7). Use original FOCUS screws.

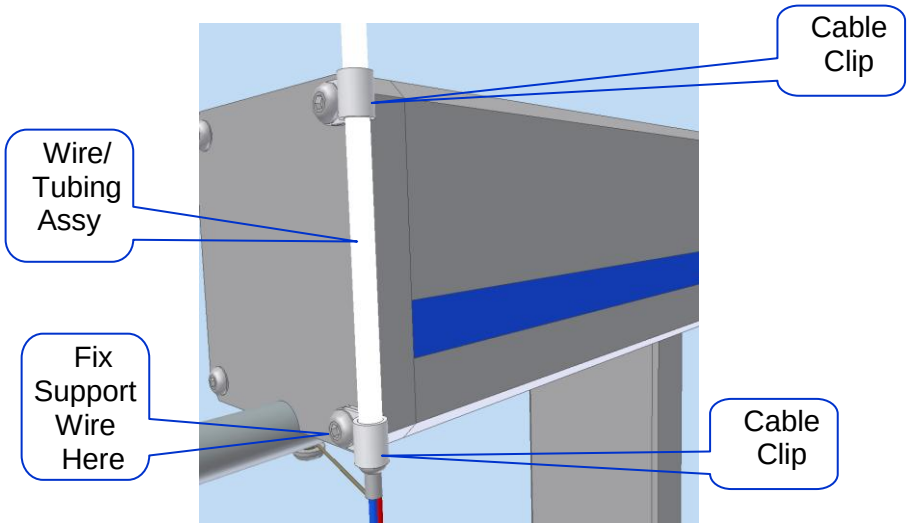



Figure 6.7 Fixing the gripper "Red/Blue" tubing assembly to the FOCUS

d) Connect compressed air supply lines to the gripper. For this, connect Gripper "Blue" and "Red" ports on the front panel of the pneumatic control box to the pneumatic ports on the gripper (see Fig. 6.8). Normally, red tubing should be connected to the "S" pneumatic port of the gripper, and blue tubing to the "O" port.

***NOTE:*** ***The gripper is always opened in the standby state. If due to some reason this is not the case, sweep the blue and red tubing's on the gripper side.***

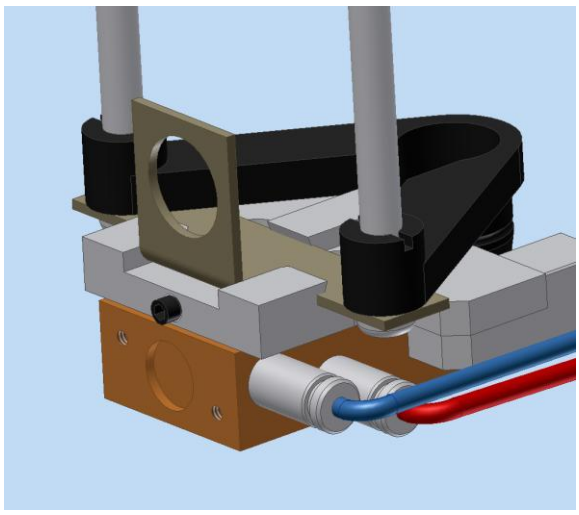


Figure 6.8 Compressed air connections to the LINEX gripper

4. Connect "Carrier Out" port on the back of the OPTIC 3 controller to "Carrier In" port on the back of the LINEX pneumatic control box. Use 1/16" PEEK tubing supplied with the kit.

5. Connect the compressed air supply to the "Air In" port on the back of the pneumatic control box.

***NOTE:*** ***Normal functioning of LINEX and the CDC Station can be disrupted if they are connected to the same source of the compressed air supply as the injector cooling. To ensure the faultless work of the system, the use separate compressed air source is recommended.***

6. Connect electrical control cable to the connectors on the back of pneumatic box, FOCUS, and OPTIC 3.

**WARNING: When Installing LINEX, make sure that there is no cable connected between the FOCUS' (CombiPAL) "Interface 1" port and GC. It can disrupt the hardware communication b*etween OPTIC 3 and autosampler and even damage the board.***

## 6.5 Tray Holder Modification

LINEX is supplied with the 28-position liner tray assembly. 96-position liner tray is available as an option. To work with the LINEX 96-position tray, it is necessary to modify the 114 mm Tray Holder of the FOCUS robotic system (Fig. 6.9). Use the 129 mm legs (ATAS GL P/No D200009) or the leg extensions to update the FOCUS Tray Holder.

1. Unscrew the legs of the tray holder
2. Place the long legs instead
3. Use the M5 screws supplied with the kit to re-assemble

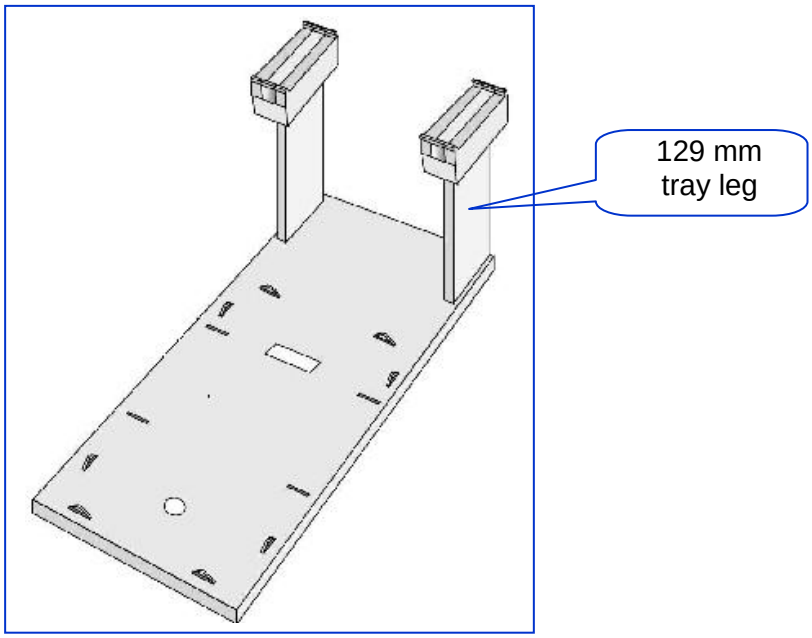



Figure 6.9 Tray holders modification

# 7. Capping-De-Capping Station

In many cases the GC injector liner should be sealed (capped) from both sides to either protect the sample, placed or collected into the liner, from deteriorating influence of the environment or keep the liner clean after conditioning. The liner should than be de-capped just before it is placed into the GC injection port. The ATAS GL Capping-De-Capping (CDC) Station is designed to automate this procedure.

## 7.1 CDC Station Hardware

The CDC station consists of the capping-de-capping unit and the liner tray for capped liners.

### 7.1.1 Capping-De-Capping Unit

The capping-de-capping unit is a pneumatically actuated mechanical device designed to remove the PTFE caps from the liner just before it is transported into the GC injection port and place them back onto the liner after it is removed from the injector. (Fig.7.1). The CDC unit is mounted onto the horizontal X-Crossrail of the FOCUS autosampler and is software controlled from the PAL Cycle Composer.

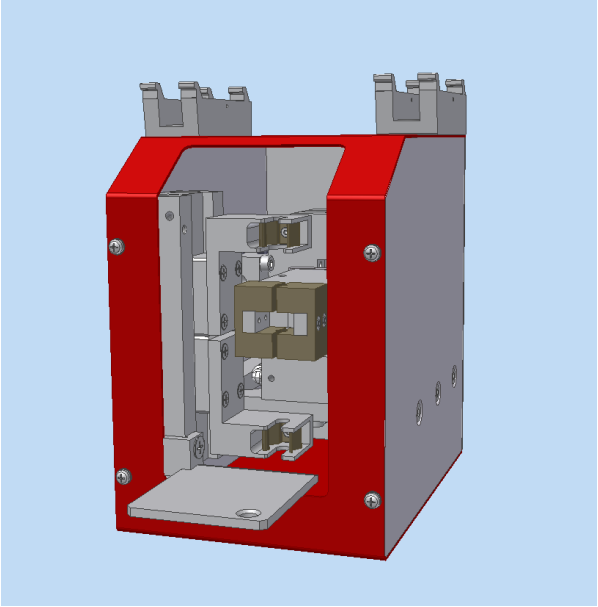


Figure 7.1 The Capping-De-Capping unit

To actuate and control the unit the following connections are available on its rear panel (Fig.7.2):

***Air In***

1/8" Swagelok type connection used to connect the compressed air supply needed to actuate the pneumatic actuators within the CDC unit.

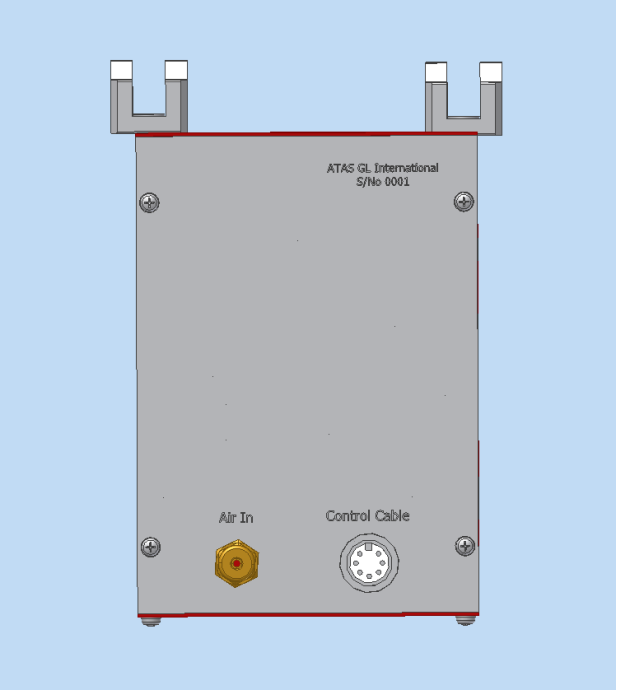



Figure 7.2 The CDC Station rear panel

***Control Cable***

Connection used to connect the CDC Station control cable from FOCUS and OPTIC.

### 7.1.2 CDC Station Liner Tray

CDC Station works with two types of trays for the capped OPTIC liners. Narrow, 28-position (2x14) tray is always supplied as a standard accessory with every CDC Station. It is mounted on the FOCUS using a special tray holder. Large, 98-position (7x14) tray, designed to be used with the standard FOCUS tray holder. It is supplied as an option.

### 7.1.3 Liner Cap

CDC Station works with the liners capped with the PTFE caps from both sides. The liner sealing is provided by the Viton o-ring integrated into the cap.

## 7.2 CDC Station Installation

This section should be read carefully in conjunction with any specific instructions supplied with the kit. Do not hesitate to contact the supplier should you have any questions.

The CDC Station is designed to work with LINEX. LINEX should be installed prior to the CDC Station unit. Please, refer to Section 6 of this guide for LINEX installation instructions.

The installation of CDC Station can be divided into the following steps:

- Installation of the CDC unit
- Liner Tray installation

### 7.2.1 Unpacking CDC Station Kit

CDC Station is shipped in a box. The box should contain the following items:

| Pos. | Item |
|---|---|
| 1 | CDC Unit |
| 2 | 28-position Liner Tray for Capped Liners |
| 3 | Control Cable* |
| 4 | CD with Macros and Objects |
| 5 | CDC Station Standard Kit |
| 6 | LINEX User's Guide* |

* If CDC Station is supplied together with LINEX, the items 3, and 6 are included in the LINEX kit.

### 7.2.2 Installing CDC Unit

**WARNING: It is important that OPTIC 3, the host GC and FOCUS be switched off until the installation is complete.**

The CDC Unit is installed onto the FOCUS X-Crossrail. To install it follow the steps:

1. Loosen the Torx screws on the CDC Unit mounting brackets.

2. Attach the CDC Unit to the left or right end of the X-Crossrail, fitting the mounting clamp teeth into the grooves on the bottom of the X-Crossrail (Fig.7.3).

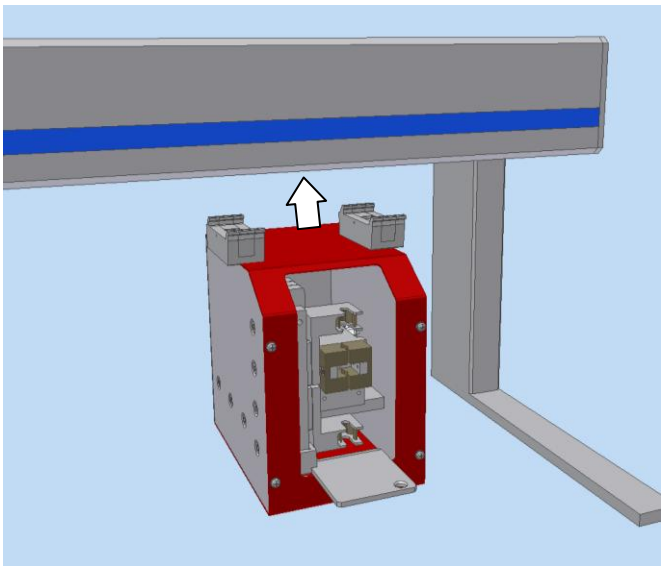


Figure 7.3 Installing the CDC Unit

3. Make sure that the clamps fit completely into the groove. Tight the Torx screws until the mounting clamps are firmly in place.

4. Connect compressed air supply line to the "Air In" port on the rear panel of CDC unit. Use PTFE tubing and Swagelok T-union supplied with the kit.

5. Connect the CDC Station control cable to the "Control Cable" connector on the rear panel of the CDC unit.

### 7.2.3 Installing a 28-position Liner Tray

**WARNING: When installing the tray, make sure that there is at least 30 mm distance between the CDC unit and the tray holder.**

1. Loosen the Torx screw on the mounting clamp located on top of the tray holder leg.

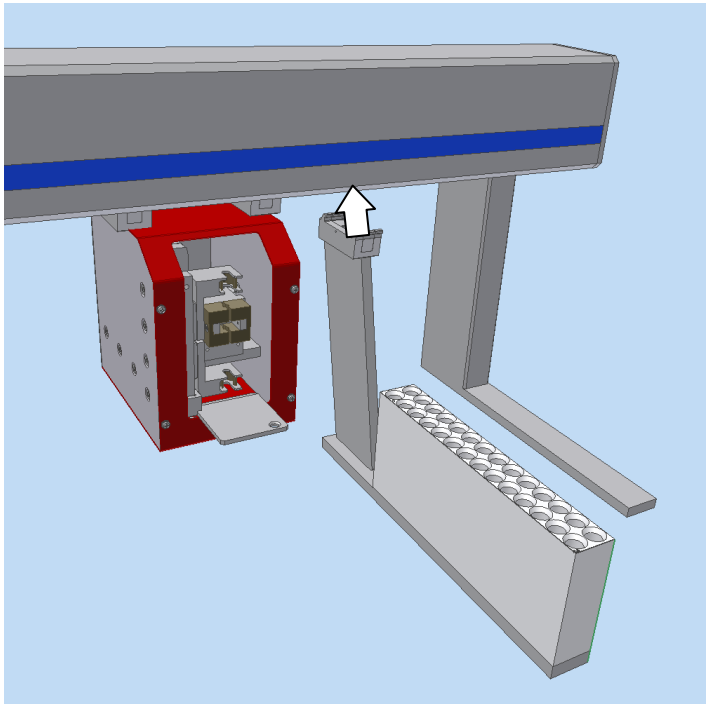


Figure 7.4 Installing the 28-position Liner Tray

2. Attach the tray to the right of the CDC unit, fitting the mounting clamp teeth into the grooves on the bottom of the X-Crossrail (Fig. 7.4). Make sure that there is at least 30 mm distance between the CDC unit and the tray holder.

3. Make sure that the clamp fits completely into the groove. Tight the Torx screw until the mounting clamp is firmly in place. To make sure that the tray holder is aligned properly, use the standard FOCUS tray holder as the reference mounting it next to the 28-position tray.

***NOTE:*** ***FOCUS tray holder should be equipped with a 174 mm legs if you intend to work with an optional 98-position tray for capped liners.***

# 8. Software Installation and Configuration

The LINEX and CDC Station are controlled from a Windows PC running PAL Cycle Composer control software. In order to operate LINEX and CDC Station it is necessary to upload the FOCUS with new objects. To upload the objects, the Object Manager has to be installed on the computer. A number of predefined macros should also be copied to the hard disc. The Object Manager and macros are supplied on a CD together with the LINEX unit and the CDC Station. All the objects, macros and methods are listed in Appendix A of this guide.

## 8.1 Object Manager

It is necessary to copy the files, which will be used to load the new objects to FOCUS, to a boot drive. The program does not work in a network environment or with any other drive. It is always recommended to install the program onto a system drive C:\.Use the existing PAL directory or create a new one. Copy files "ObjMan.exe" and "LINEX Fast Tune.pol" to the PAL directory. "CDC Fast Tune.pol" should also be copied to the same directory if you intend to work with the CDC Station.

## 8.2 Uploading Objects List

To upload FOCUS with the new objects perform the following steps:

1. Run "ObjMan.exe" from Windows Explorer.

2. Select a desired Object List (LINEX Fast Tune v1.pol, for instance) from the dialog window (Fig. 8.1).

3. Send the selected Object Lists to FOCUS using "Send" button. Wait for confirmation of a successful transfer – "… objects downloaded".

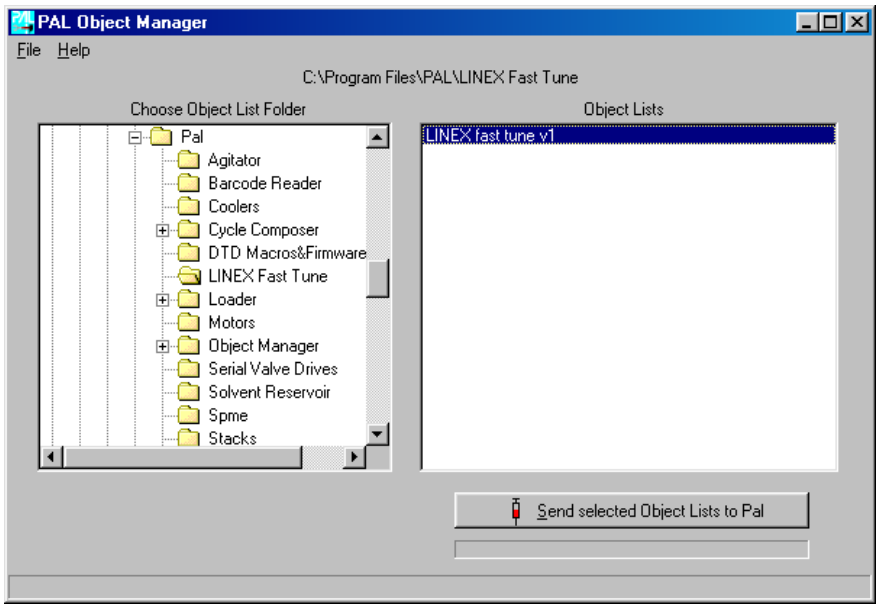



Figure 8.1 Menu window of PAL Object Manager

4. Turn OFF the FOCUS power supply and wait for at least 5 seconds.

5. Turn ON the FOCUS power supply again.

It is recommended to perform a backup of the FOCUS system software after the objects reference positions are verified. Use PAL LOADER Program as described in PAL System User Manual (Chapter 10, "PAL Loader Program") to perform the backup.

## 8.3 LINEX Macros

There are a number of predefined standard macros supplied with the LINEX and CDC Station CD's. Copy these macros to the default PAL directory: C:/Program files/Pal/Cycle Composer/Combi PAL/. These macros are the building blocks of the Single and Multi Step Methods which can be created by the user. The examples of the methods are also supplied on the CD's. All the macros supplied with the LINEX and the CDC Station are listed in Appendix A.

# 9. FOCUS Objects for LINEX and CDC Station

***NOTE!*** *Remove the Syringe from the FOCUS Injection Unit before performing the verification of the LINEX objects reference positions.*

A number of new objects were added to the standard FOCUS object list to work with LINEX and CDC Station. The reference positions for all the objects are predefined and stored in "LINEX Fast Tune.pol" and "CDC Station Fast Tune.pol" files. They should be uploaded to FOCUS before attempting to operate the LINEX and the CDC Station.

## 9.1 LINEX Objects

***OPTIC 3***

It is the OPTIC 3 injector head in standard configuration (without LINEX). The reference position for this object is the position of the injector septum nut. The LINEX gripper fingers should be centered on the injection hole of the septum nut with the bottom of the fingers touching the top of the nut. For alignment, use the LINEX Alignment Ring (p/no L200028) included in the kit.

***OPTICLIN***

It is the OPTIC 3 injector with LINEX head closed. This object is used for liquid injections with LINEX head mounted on the OPTIC 3 injector. The reference position for this object is the position of the LINEX septum nut. The LINEX gripper fingers should be centered on the injection hole of the septum nut with the bottom of the fingers touching the top of the nut. For alignment, use the LINEX Alignment Ring (p/no L200028) included in the kit.

***OPTICGRI***

It is the OPTIC 3 injector with LINEX head opened. This object is used for the liner exchange. The reference position for this object is the position of the injector opening. The LINEX gripper fingers should be centered on the injector liner opening with the bottom of fingers touching the tapered surface of the opening.

***GRIP***

It is a tray type used for LINEX liner tray.

***GRIPHLDR***

It is a tray holder for the LINEX liner tray.

In case of 28-position tray, the reference position for this object is the position of the hole number 14. The LINEX gripper fingers should be centered in the hole.

In case of the 98-position liner tray, the reference position for GRIPHLDR object is the hole in the base plate of the standard FOCUS tray holder. The LINEX gripper fingers should be centered in the hole with the bottom of the fingers flush with the bottom of the base plate.

***LINEXT28 or LINEXT98***

It is a liner in the LINEX liner tray. The initial reference position for this object is the position of the liner No 1 in the LINEX liner tray. The LINEX gripper fingers should be centered on the liner with the bottom of the fingers touching the top of the liner. LINEXT28 is used for the 28-position tray and LINEXT98 for the 98-position tray.

***NOTE:*** ***When using 98-position LINEX tray, change the position of a dummy liner from 28 to 98 in "Place Dummy" and " Remove Dummy" macro's.***

## CDC Station Objects

### *CDC*

It is a tray type object used for the 98-position liner tray for capped liners.

### *CDC28*

It is a tray type object used for the 28-position liner tray for the capped liners.

### *CDCSTN0*

CDCSTN0 is a tray type object defining the CDC unit as a tray.

### *CDCHLDR*

It is a tray holder object used for the 28- or 98-position liner trays for the capped liners. In case of 28-position liner tray, the reference position for this object is the position of the hole No 14 in the liner tray. The LINEX gripper fingers should be centered in the hole. In case of 98-position liner tray, the reference position for this object is the position of a hole in the base plate of the standard tray holder. The LINEX gripper fingers should be centered in the hole with the bottom of the fingers flush with the bottom of the base plate.

### *CDCSTNH*

It is a tray holder object used for CDC unit. The reference position for this object is the position of the hole in the Liner Home Plate of the CDC unit (Fig. 9 .1). The LINEX gripper fingers should be centered in the hole with the bottom of the fingers touching the tapered surface of the hole.

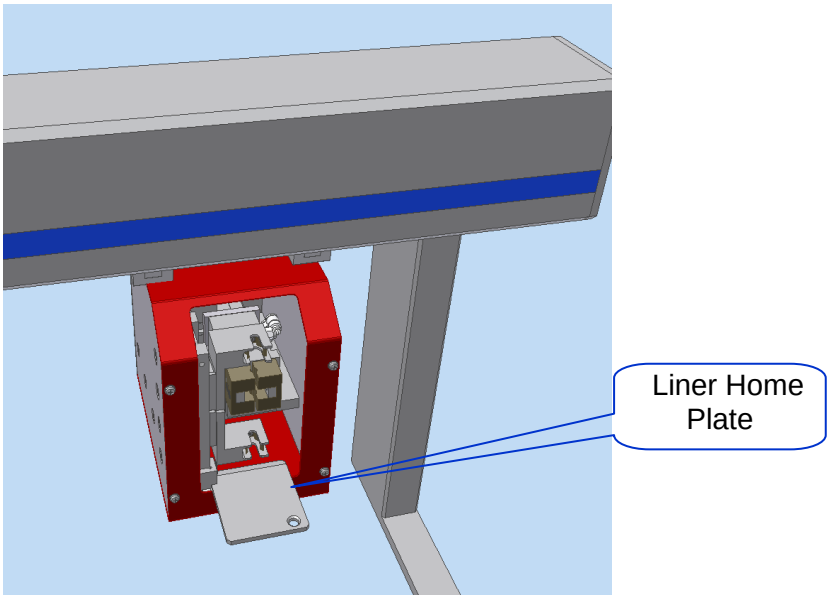



Figure 9.1 Reference position for the CDC unit

***CDCTRAY***

It is a liner in the 98-position liner tray for the capped liners. The initial reference position for this object is position of the liner No 1 in the LINEX liner tray. The LINEX gripper fingers should be centered on the liner cap with the bottom of the fingers touching the top of the cap.

***CDCT28***

It is a liner in the 28-position liner tray for the capped liners. The initial reference position for this object is position of the liner No 1 in the LINEX liner tray. The LINEX gripper fingers should be centered on the liner cap with the bottom of the fingers touching the top of the cap.

***CDCSTNT***

It is a liner gripped by the CDC unit liner gripper in its front position (Fig. 9.2). The reference position of this object is the top of the liner cap. The LINEX gripper fingers should be centered on the liner cap with the bottom of the fingers touching its top.

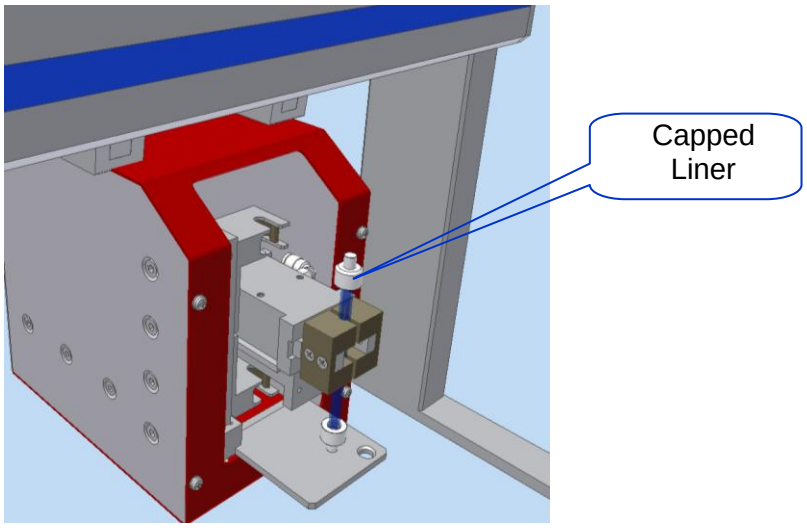



Figure 9.2 Liner gripped by the CDC unit liner gripper in its front position

## 9.2 Object Position Verification

***NOTE:*** ***LINEX gripper should be in the closed state while verifying the reference positions of all the LINEX and CDC Station objects.***

Make sure that the LINEX, the Gripper, the CDC Station, and the LINEX Liner Tray are properly mounted on the FOCUS. The LINEX head should be properly mounted on the OPTIC injector.

All the LINEX and CDC Station objects and also their reference positions are predefined and saved in the "LINEX Fast Tune.pol" and "CDC Station Fast Tune.pol" files. These files should be uploaded to FOCUS as it is described in Chapter 8 of this guide. The reference positions of all the objects should be checked with every new

LINEX and/or CDC Station installation. Below is an example of how to teach and verify the reference positions of OPTICGRI object. The described procedure is common for all the other LINEX and CDC Station objects.

Make sure that the FOCUS and OPTIC 3 are ON. Close the LINEX gripper and open the LINEX head. Run "Gripper Close" and "Head Open" methods one by one. Make sure that there is no liner in the injector. Follow the steps:

1. Observe the keypad display. When the "Job Queue" menu is shown, complete the following sequence (common to all objects): Menu → Setup → Objects → Injectors → OPTICGRI, where name "OPTICGRI" represents a predefined injector.

2. After selecting "OPTICGRI", the XYZ positions associated with the object will be displayed.

3. Highlight the item Position X: with the cursor bars and press ENTER. The Injection Unit will move to the previous defined X-axis position.

4. Rotate the outer knob to roughly adjust the X- axis position to the OPTICGRI reference position.

5. Press the inner knob to ENTER the Position X value.

6. Repeat steps 3-5 for Position Y and Position Z.

7. Press the F3 button "Move to Zero". The Injection Unit will move to the HOME position.

8. Verify the defined X Y Z Positions by pressing F1 "Check Pos".

# 10. Operating LINEX

This chapter presents the information on how to set up and operate the LINEX and the CDC Station. It provides basic overview for the new users and the users, which work infrequently with the device. Before the information is used, the hardware and software should be installed and software objects defined correctly.

## 10.1 Cycle Composer

The LINEX unit works only with the PAL Cycle Composer that allows customization of sampling cycles for the FOCUS robotic system. This software is supplied with every FOCUS unit. For installation and operating of the PAL Cycle Composer refer to its manual.

The Cycle Composer also includes a Method Editor that allows defining a sequence of the sample processing steps and saving it as a Cycle Composer method.

## 10.2 Method Editor

### 10.2.1 Single Step Methods

Single Step Method uses a single macro that has the complete built-in sample processing cycle. All values, which control the cycle, are shown on a single page. Selecting just one macro makes a typical Single Step Method. The method that opens the LINEX head is seen in the example below (Fig. 10.1). Together with another example method "LINEX Open Head", it is included on the CD supplied with the unit.

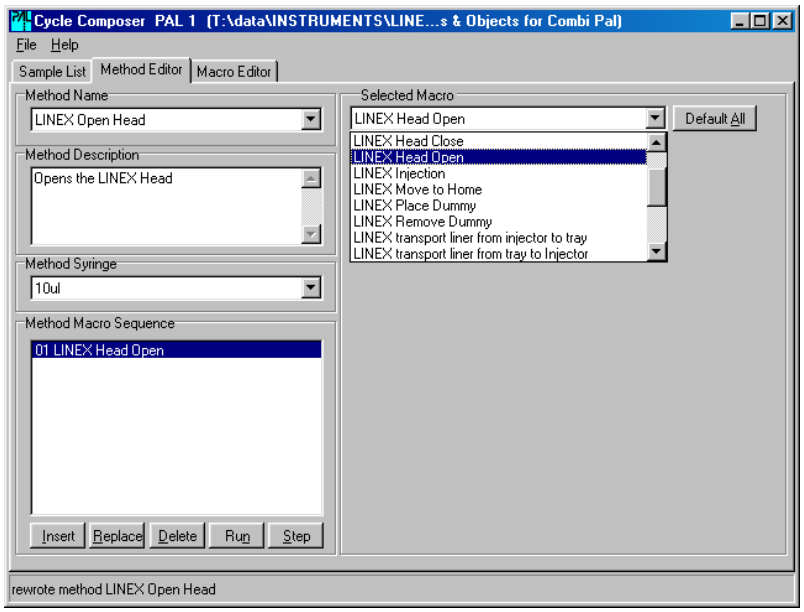



Figure 10.1 Example screen from the PAL Cycle Composer

Because a Single Step Method consists of a single macro with the associated parameter values, the sequence of processing steps can not be changed at this level. But often it is possible to change some aspects of the cycle by setting some

parameters accordingly. To make a "real" LINEX method, a Multi Step Method should to be used.

### 10.2.2 Multi Step Method

Single Step Method has a fixed sequence of the FOCUS operations, which can not be altered by the user. If this is not appropriate for the application, the user can compose its own sequence. Macros are combined to construct a new sampling cycle – Multi Step Method. Multi Step Method consists of a sequence of the macros each having its own set of the parameter values. Two examples of the Multi Step Methods are included on the LINEX CD (files "Place Dummy.pme" and "Remove Dummy.pme").

***NOTE:*** ***When using 98-position LINEX tray, change the position of a dummy liner from 28 to 98 in "Place Dummy" and " Remove Dummy" macro's.***

A set of standard macros is installed together with the Cycle Composer. A list and description of the available macros are provided in the chapter "Standard Macros" of the Cycle Composer User Manual. There are also LINEX Macros supplied with the LINEX Unit. All these macros are listed in the Appendix A to this guide.

### 10.2.3 Composing a New Method

To create a new Multi Step Method, select "New Method" under the "File" menu, and give it a name (Fig. 10.2).

Select the syringe to be used for this method. It is essential that the syringe be selected before macros are added to the method. The selected syringe sets different default values and ranges for volumes and flow rates. It is possible to change the syringe for an existing method but it can be that Macro values are no more within the valid range and have to be adjusted.

Start to compose the sequence of operations in the box labeled "Method Macro Sequence" using the available macros from the list on the right side labeled "Selected Macro". Moving the cursor to the macro name displays a hint with a short description of the Macros function.

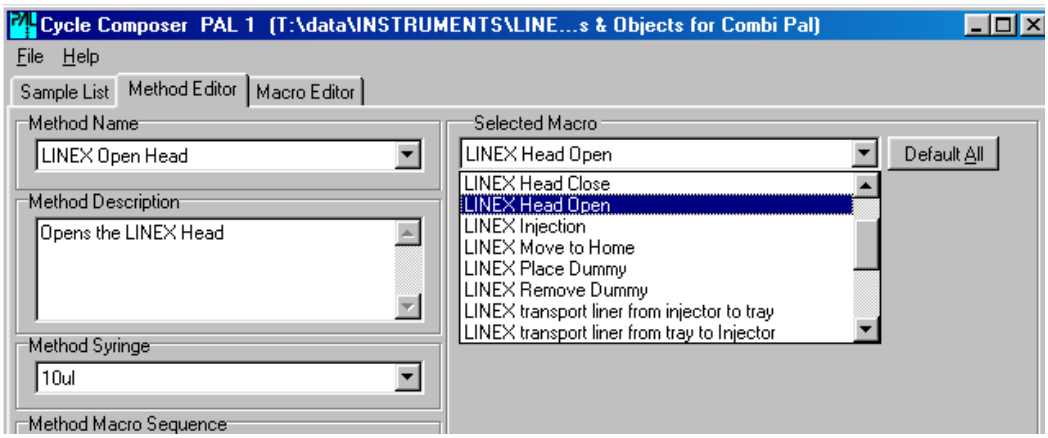


Figure 10.2 Example of Cycle Composer Method Editor Screen

After the macro has been selected, modify the required parameters presented in the table below it (if one exists). When this is done, select the "Insert" button under the Method Macro Sequence table and the macro will be placed in the sequence at the current position. Repeat this process for each step in the sequence.

If a parameter for any macro has to be modified, select the macro in the sequence for which the modification is to be made, then change the desired value. If the macro is not changed then the new value is automatically applied. Moving the cursor to the parameter field displays a hint with the minimum, maximum and default values.

Clicking the right mouse button, having cursor on a field, displays a list of possible values like Default value, Syringe, and Sample List. The values, which are shown, depend on the actual field unit. Values starting with "SYR" reference the method syringe (Min and Max Volumes and Default Plunger Speed). Values starting with 'SL' reference the Sample List Columns (Volume, Tray, Sample, Injector, etc). If a different macro needs to be put into an existing sequence, select the new macro, set the parameters as desired and click the "Replace" button.

### 10.2.4 Method Description

It is important to stress the benefit of a good description for each Method. The description entered in the "Method Description" box will provide information to the user in the Sample List screen. This is displayed whenever the user rests the cursor over each method in the List. Likewise, each macro contains a description, which will be displayed when the user rests the cursor on the selected Macro in the Method Editor screen.

### 10.2.5 Testing with RUN and STEP

When a Method has been created, it can be tested before implementing it into a Sample List by selecting the "Run" or "Step" button.

If Run mode is selected, the operator is prompted to enter values, which are normally passed by the Sample List. If Step mode is selected, each command sent to the PAL is displayed before it is executed. A macro may consist of several PAL commands.

### 10.2.6 Saving Changes

Whenever a Method is changed, it is not saved immediately to the disk. This is done explicitly with the menu "File/Save" or "File/Save as…". If the user switched to the Sample List but did not yet save the Method, a dialog box asks if the changed method should be saved.

# 11. Maintenance

LINEX needs little routine maintenance other than replacing consumables. If there are problems with using the unit, please see Section 12 "Troubleshooting and diagnostics".

## 11.1 Routine Maintenance

There are no special recommendations for routine maintenance other than those, which should be standard for Good Laboratory Practice.

## 11.2 Servicing

The LINEX Unit is not designed to be user-serviced. If there is a problem, which can not be rectified by following the troubleshooting instructions from Section 12 of this guide, contact your local agent for advice.

Look on our web site www.atasgl.com for the latest information on LINEX and other ATAS GL products.

# 12. Troubleshooting and Diagnostic

Should any difficulty arise with the installation or operation of LINEX, check the following problems before contacting your supplier.

## 12.1 Head does not open or close

Are both OPTIC 3 and FOCUS switched ON? Is the control cable connected to OPTIC 3, FOCUS and the LINEX pneumatic box? Is the compressed air supply delivers required pressure (5 bars) to the "**Air In**" port of the LINEX pneumatic box?

## 12.2 Liner catches on the tray or injector

Check the FOCUS alignment for the injector and tray objects. Follow the standard procedure for the FOCUS object position verification described in the FOCUS (CombiPAL) manual.

## 12.3 Liner is caught by the head when injector is opened

1. Is the liner return spring present in the LINEX head? It can be that the spring has been lost or not installed by accident.

2. Is the injector pressure released before the head is opened? It is especially important in case the fritted or packed liners are used.

## 12.4 Gripper does not grip liner

1. Check the FOCUS alignment for the injector and tray objects. Follow the standard procedure for the FOCUS object position verification described in the FOCUS (CombiPAL) manual.

2. Ensure that the compressed air supply delivers minimum 5 bars pressure to the "Air In" port of the LINEX pneumatic control box. The pressure should be stable. If the same air supply is used for some other purposes (cooling OPTIC 3 or other injector, for instance), this can disrupt normal functioning of the gripper.

## 12.5 Leakage in the system

Leakage can be caused by one of the following:

1. Compressed Air Supply Pressure Too Low

   The LINEX head will start to leak when the compressed air supply pressure is too low. Increase pressure to 5 bars, to ensure normal operation of the LINEX unit. The maximum allowed pressure is 7 bars.

2. Pressure in the in injector is too high

   The LINEX head is designed to work with the pressure up to 5 bars in the injector. Higher injector pressure could cause the leak from the injector.

# Appendix A: List of Objects, Macro's and Methods

| Item | Name | Type | Description |
|---|---|---|---|
| 1 | OPTIC 3 | Injector | OPTIC 3 standard injector head position. Standard top boss is used. |
| 2 | OPTICLIN | Injector | OPTIC 3 injector with LINEX head closed. Used for liquid injections. |
| 3 | OPTICGRI | Injector | OPTIC 3 injector with LINEX head opened. Used for liner exchange. |
| 4 | GRIP | Tray Type | Tray type used for LINEX liner tray |
| 5 | GRIPHLDR | Tray Holder | Position of the tray holder for LINEX liner tray |
| 6 | LINEXT28 | Tray | Position of liner no. 1 in the LINEX liner tray |
| 7 | LINEXT98 | Tray | Position of liner no. 1 in the LINEX liner tray |

Table A1. List of the LINEX objects

| Item | Name | Type | Description |
|---|---|---|---|
| 1 | Gripper Close | Macro | Instructs FOCUS to close LINEX gripper |
| 2 | Gripper Open | Macro | Instructs FOCUS to open LINEX gripper |
| 3 | LINEX Head Close | Macro | Instructs FOCUS to open LINEX head |
| 4 | LINEX Head Open | Macro | Instructs FOCUS to open LINEX head |
| 5 | LINEX Injection | Macro | Instructs FOCUS to perform liquid injection into OPTIC injector with the LINEX head closed |
| 6 | LINEX Place Dummy | Macro | Opens LINEX head and transports liner from position no. 98 into the injector |
| 7 | LINEX Remove Dummy | Macro | Transports liner from the injector into position no. 98 of the liner tray |
| 8 | Reset FOCUS | Macro | Resets FOCUS |
| 9 | Start OPTIC | Macro | Instructs FOCUS to send "Run Out" signal to OPTIC |
| 10 | Transport Liner Injector Tray | Macro | Shuts carrier gas flow to injector. Vents injector. Opens LINEX head and transports liner from injector into the specified position of the liner tray |
| 11 | Transport Liner Tray Injector | Macro | Transports liner from the liner tray specified position into injector. Closes LINEX head. Restores carrier gas flow through injector. |
| 12 | Wait 5 sec | Macro | Instruct FOCUS to wait 5 sec befor next macro is performed. |
| 13 | Wait OPTIC Ready | Macro | Instruct FOCUS to wait for OPTIC "Ready In" signal. |
| 14 | Start OPTIC | Macro | Instructs OPTIC to start run |
| 15 | Error Entry | Macro | Safety macro |
| 16 | Error Exit | Macro | Safety macro |
| 17 | Method Entry | Macro | Safety macro |
| 18 | Method Exit | Macro | Safety macro |

Table A2. List of the LINEX macros

| Item | Name | Type | Description |
|---|---|---|---|
| 1 | Example Method Liquid Injection | Method | Example of method for liquid injection into OPTIC injector with LINEX head closed. |
| 2 | Example Method Thermal Desorption | Method | Example of method for LINEX-TD application. |
| 3 | Gripper Close | Method | Instructs FOCUS to close LINEX gripper |
| 4 | Gripper Open | Method | Instructs FOCUS to open LINEX gripper |
| 5 | Head Close | Method | Instructs FOCUS to open LINEX head |
| 6 | Head Open | Method | Instructs FOCUS to open LINEX head |
| 7 | Place Dummy | Method | Opens LINEX head and transports liner from position no. 98 into the injector. |
| 8 | Remove Dummy | Method | Transports liner from the injector into position no. 98 of the liner tray. |
| 9 | Reset FOCUS | Method | Resets FOCUS |
| 10 | Transport Liner Tray Injector&Back | Method | Transports liner from the liner tray specified position into injector. Closes LINEX head. Restores carrier gas flow through injector. Waits 5 sec. Shuts carrier gas flow to injector. Vents injector. Opens LINEX head and transports liner from injector into the specified position of the liner tray. |
| 11 | Example Liquid Injection Sample List | Sample List | Example of sample list for liquid injection into OPTIC injector with LINEX head closed. |
| 12 | Example Thermal Desorption Sample List | Sample List | Example of sample list for LINEX-TD application. |

Table A3. List of the LINEX methods and sample lists

| Item | Name | Type | Description |
|---|---|---|---|
| 1 | CDC | Tray Type | Tray type used for 98-position liner tray |
| 2 | CDC28 | Tray Type | Tray type used for 28-position liner tray |
| 3 | CDCSTN0 | Tray Type | Tray type used for CDC unit reference |
| 4 | CDCHLDR | Tray Holder | Reference position of the tray holder for LINEX liner tray |
| 5 | CDCSTNH | Tray Holder | Reference position of the CDC unit |
| 6 | CDCTRAY | Tray | Position of liner no 1 in the 98-position liner tray |
| 7 | CDCT28 | Tray | Position of liner no 1 in the 28-position liner tray |
| 8 | CDCSTNT | Tray | Position of the capped liner in the CDC unit |

Table A4. List of the CDC Station objects

| Item | Name | Type | Description |
|---|---|---|---|
| 1 | CDC Gripper Close | Macro | Instructs FOCUS to close liner gripper |
| 2 | CDC Gripper Open | Macro | Instructs FOCUS to open liner gripper |
| 3 | CDC Decapper Close | Macro | Instructs FOCUS to close de-capping gripper |
| 4 | CDC Decapper Open | Macro | Instructs FOCUS to open de-capping gripper |
| 5 | CDC Slider Back | Macro | Instructs FOCUS to move CDC unit slider to the back position |
| 6 | CDC Slider Front | Macro | Instructs FOCUS to move CDC unit slider to the front position |
| 7 | CDC Place Dummy | Macro | Opens LINEX head and transports liner from position no. 28 into the injector. |
| 8 | CDC Remove Dummy | Macro | Transports liner from the injector into position no. 28 of the liner tray |
| 9 | CDC Reset | Macro | Resets CDC Station |
| 10 | Transport Liner Injector-CDC-Tray | Macro | Shuts carrier gas flow to injector. Vents injector. Opens LINEX head and transports liner from injector to CDC Station und than into the specified position of the liner tray |
| 11 | Transport Liner Tray-CDC-Injector | Macro | Transports liner from the liner tray specified position to CDC Station and than into injector. Closes LINEX head. Restores carrier gas flow through injector. |
| 12 | Transport Liner Tray-CDCS-Tray | Macro | Transports liner from the liner tray specified position to CDC Station and back into the same liner tray position. |

Table A5. List of the CDC Station macros

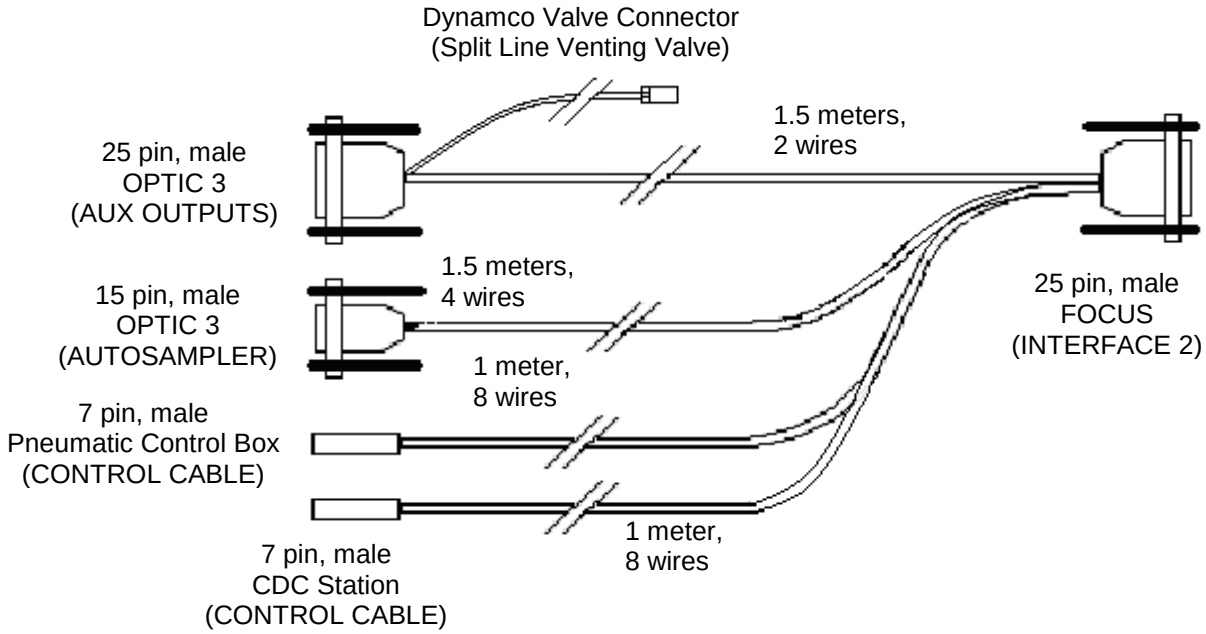
| Item | Name | Type | Description |
|---|---|---|---|
| 1 | Example Method Liquid Injection | Method | Example of method for liquid injection into OPTIC injector with LINEX head closed. |
| 2 | Example Method Thermal Desorption | Method | Example of method for LINEX-TD application. |
| 3 | CDC Gripper Close | Method | Instructs FOCUS to close liner gripper |
| 4 | CDC Gripper Open | Method | Instructs FOCUS to open liner gripper |
| 5 | CDC Decapper Close | Method | Instructs FOCUS to close de-capping gripper |
| 6 | CDC Decapper Open | Method | Instructs FOCUS to open de-capping gripper |
| 7 | CDC Slider Front | Method | Instructs FOCUS to move CDC unit slider to the front position |
| 8 | CDC Place Dummy | Method | Opens LINEX head and transports liner from position no. 28 into the injector. |
| 9 | Place Dummy | Method | Opens LINEX head and transports liner from position no. 28 into the injector. |
| 10 | Remove Dummy | Method | Transoprts liner from the injector into position no. 28 of the liner tray. |
| 11 | Reset CDC | Method | Resets CDC Station |
| 12 | Transport Liner Injector-CDC-Tray | Method | Shuts carrier gas flow to injector. Vents injector. Opens LINEX head and transports liner from injector to CDC Station und than into the specified position of the liner tray. Rsets CDC Station. |

| | | | |
|---|---|---|---|
| 13 | Transport Liner Tray-CDC-Injector | Method | Transports liner from the liner tray specified position to CDC Station and than into injector. Closes LINEX head. Restores carrier gas flow through injector. Resets CDC Station. |
| | Transport Liner Tray-CDCS-Tray | Method | Transports liner from the liner tray specified position to CDC Station and back into the same liner tray position. Resets CDC Station. |
| 13 | Example Liquid Injection Sample List | Sample List | Example of sample list for liquid injection into OPTIC injector with LINEX head closed. |
| 14 | Example Thermal Desorption Sample List | Sample List | Example of sample list for LINEX-TD application. |

Table A6. List of the CDC Station methods and sample lists

# Appendix B: LINEX Control Cable

***NOTE!*** *Any pin that is not listed in the following tables is not connected.*




| **OPTIC 3 Connector "AUTOSAMPLER"** | | | **FOCUS Connector "INTERFACE 2"** | |
|---|---|---|---|---|
| *Wire color* | *Pin* | *Description/Signal Name* | *Pin* | *Description/Signal Name* |
| Yellow | 6 | Run Input | 4 | TTL-Out1, Start Out |
| Green | 5 | 0 V | 14 | GND |
| Brown | 1 | Ready Output | 1 | TTL-In1 , Wait In |
| White | 2 | Ready Output | 15 | GND |

| **OPTIC 3 Connector "AUX OUTPUTS"** | | | **FOCUS Connector "INTERFACE 2"** | |
|---|---|---|---|---|
| *Wire color* | *Pin* | *Description/Signal Name* | *Pin* | *Description/Signal Name* |
| Yellow | 1 | 24V | 9, 10 | SW-Out1 NO, SW-Out 2 NO |
| White | 2 | 0V | | Loop in the connector * |

| **PNEUMATIC BOX Connector "CONTROL CABLE"** | | | **FOCUS Connector "INTERFACE 2"** | |
|---|---|---|---|---|
| *Wire color* | *Pin* | *Description/Signal Name* | *Pin* | *Description/Signal Name* |
| Brown/Gray | 1 | 0 V | | Loop in the connector * |
| Pink | 6 | Carrier On | 22 | SW-Out1 COM |
| | 4 | Gripper Valve | 11 | Pwr-Out 1 + |
| | 2 | Gripper Valve | 24 | Pwr-Out 1 - |
| | 5 | Head Valve | 12 | Pwr-Out 2 + |
| | 3 | Head Valve | 25 | Pwr-Out 2 - |
| Green | GND | GND | 16 | GND |

| **CDC Station Connector "CONTROL CABLE"** | | | **FOCUS Connector "INTERFACE 2"** | |
|---|---|---|---|---|
| *Wire color* | *Pin* | *Description/Signal Name* | *Pin* | *Description/Signal Name* |
| Brown | 1 | 0V | 17 | Connect to pin 2 of OPTIC 3 "AUX OUTPUTS" Connector (0V) |
| | 7 | 24V | 10 | SW Out2 No |
| | 4 | Liner Gripper Valve | 5 | TTL-Out2 |
| | 5 | CDC Valve | 6 | TTL-Out3 |
| | 6 | Slider Valve | 23 | SW Out2 COM |
| Shield | GND | GND | 17 | GND |
| **DINAMCO Pressure Release Valve Connector** | | | | |
| *Wire color* | *Pin* | *Description/Signal Name* | *Description/Signal Name* | |
| Red | 1 | Pressure Release | Connect to pin 22 of FOCUS "INTERFACE 2" Connector. Wire it through OPTIC 3 "AUX OUTPUTS" Connector | |
| Black | 2 | 0 V | Connect to pin 2 of OPTIC 3 "AUX OUTPUTS" Connector | |

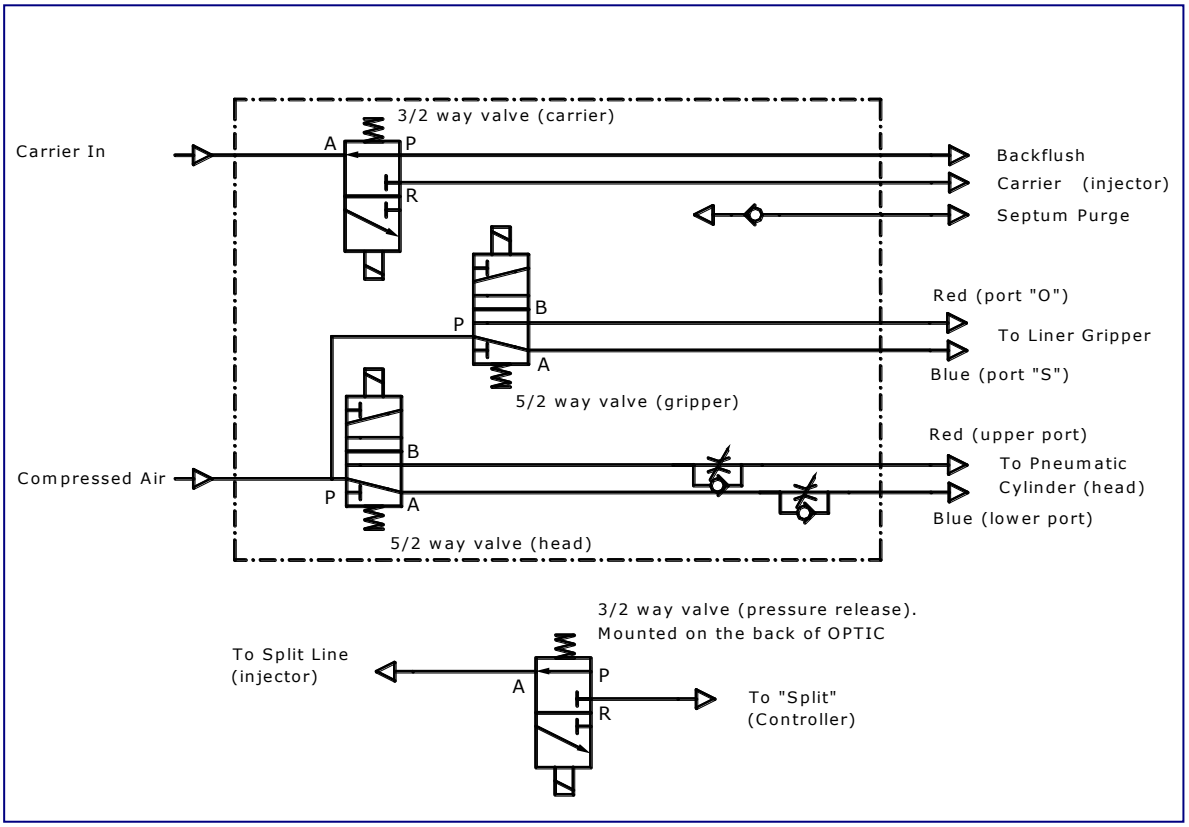
** Loop inside of the connector to connect white and brown wires*

| Item | Signal | Function | Description |
|---|---|---|---|
| 1 | SW Out1 | On – carrier is OFF, OFF – carrier is ON | LINEX carrier valve control |
| 2 | SW Out2 | On – slider front, OFF – slider back | CDCS slider control |
| 3 | TTLIn1 | High - waiting for OPTIC | Wait for OPTIC Ready control |
| 4 | TTLOut1 | Low – starts OPTIC | Start signal to OPTIC |
| 5 | TTLOut2 | Low – CDCS gripper closed, High – CDCS gripper opened | CDCS liner gripper control |
| 6 | TTLOut3 | Low – CDCS capper closed, High – CDCS capper opened | CDCS capper gripper control |
| 7 | PwrOut1 | ON – LINEX gripper closed, OFF – LINEX gripper opened | LINEX gripper control |
| 8 | PwrOut2 | ON – LINEX head opened, OFF – LINEX head closed | LINEX head control |

Table B1. List of the FOCUS I/O signals

# Appendix C: LINEX Pneumatic Flow Control Diagram

***NOTE!*** *All valves are shown in the ON state (gripper closed, head opened, carrier gas connected to backflush line, injector pressure released).*




Components shown within dashed area are mounted in the LINEX pneumatic control box. The pressure release valve is mounted on the rare panel of the OPTIC 3 controller.

# Appendix D: Accessories, Consumables, and Spares

## 1. Selected Injector Liners

| | Part number | Pack Size |
|---|---|---|
| Fritted liner, frit at 15 mm from the bottom | A100001 | 5 |
| Liner for split injections (single necked) | A100092 | 5 |
| Quartz liner for split injections (single necked) | A100127 | 5 |
| Double necked liner for thermal desorption | A100048 | 5 |
| Empty liner for Splitless injections | A100049 | 5 |
| "A" type packed liner for large volume injections | A100060 | 5 |
| "8270" packed liner for large volume injections | A100095 | 5 |
| Multi-capillary liner for large volume injections | A100056 | 5 |
| LINEX DMI Liner | L100011 | 5 |
| LINEX DMI Needle Guide Straight (glass) | L100010 | 5 |
| DMI Liner Insert (micro vial) | D100005 | 100 |
| LINEX TD Liner with frit on 20 mm | L100009 | 5 |

## 2. Consumables

| | | |
|---|---|---|
| Low Bleeding White Septa, 11 mm | H100001 | 25 |
| OPTIC Liner O-Ring | A100119 | 50 |
| Ferrule for special backflush tee | H100007 | 10 |
| PTFE Liner Cap Type B | L400020 | 10 |
| 1/16" Stainless Steel Tubing, 1.5 m | L200042 | 1 |

## 3. Spares

| | | |
|---|---|---|
| Standard Septum Cap | H200002 | 1 |
| 1/8 - 1/16 PTFE Reducing Ferrule | A100030 | 10 |
| OPTIC 3 Injector Body High Power | H400054 | 1 |
| Injector Top Boss Assembly | H400019 | 1 |
| Solvent Monitor-Filter Assy | H400057 | 1 |
| GC Oven Thermocouple | H200005 | 1 |
| OPTIC 3 Main EGC Channel | H400004 | 1 |
| Special Union Tee for Backflush (OPTIC 2) | D200005 | 1 |

| | | |
|---|---|---|
| 129 mm leg for tray holder | D200009 | 2 |
| 174 mm leg for tray holder | L200039 | 2 |
| Special Union Tee for Backflush (OPTIC 3) | H500015 | 1 |
| LINEX 98-position Liner Tray | D400017 | 1 |
| OPTIC 3 – FOCUS - LINEX Control Cable | L400005 | 1 |
| Top cover Agilent 6890 (blue) modified for LINEX | L200008 | 1 |
| CDC Station 28-position Tray Assy (capped liners) | L400018 | 1 |
| CDC Station 98-position Tray Kit (capped liners) | L400018 | 1 |
| Dummy Liner Tray Insert | L200041 | 1 |
| FOCUS Agitator Lead Bracket | L200018 | 1 |

# Appendix E: Liner Selection Guide

***Notes:***

1. *All liners are compatible with OPTIC 2 as well as with OPTIC 3 standard injectors.*
2. *Silanisation of liners: Each liner can be deactivated using a high pressures silanisation process. To order silinazed liners, add an "S" to the part number of the liner. For example, A100001-S.*
3. *For the information on liners for ATAS GL DTD unit, please send a request to info@atasgl.com.*

P/No A100001, Fritted Liner, frit at 15 mm from the liner bottom

This liner contains a medium porosity frit made from sintered, deactivated glass. This liner can be used for hot and cold split and splitless injections. In addition, if used with a suitable packing material the liner can be used for large volume injection, thermal desorption, solid sampling and pyrolysis applications. If packed, a bed depth of up to 25 mm can be employed and retained in place with a plug of deactivated glass or quartz wool. Pack size: 5

P/No A100092, Single-Necked Liner for Split Injections

This liner is specially made for hot or cold split injections. The liners large internal diameter of 3.2 mm makes for good mixing of the sample with the carrier gas. The liner may be packed with a little glass wool if desired. The bottom of the liner has a small slot to ensure free passage of gas to the split exit. Pack size: 5

P/No A100049, Liner for Splitless Injections

This liner is for hot and cold splitless injection of sample volumes below 3 µl. The narrow internal diameter of 1 mm ensures fast transfer of the sample to the column under splitless conditions. We advise this liner for SPME techniques. Pack size: 5

P/No A100132, Baffled Splitless Liner

This liner is for hot and cold splitless injection of sample volumes below 3 µl. The narrow internal diameter of 1 mm ensures fast transfer of the sample to the column under splitless conditions. With this liner the sample is not injected directly to the bottom of the injector. This liner will give better results for the high boiling components. Pack size: 5

P/No A100128, On-Column Liner for 0.32mm columns

This liner has a small ID with a tapered restriction 10 mm from the top. With a column installed into the restriction, true on-column injection can be performed. On-column provides the best possible reference when developing large volume injection methods. Look in manual how to do. Liner can not be used with LINEX. Pack size: 5

P/No A100129, On-Column Liner for 0.53mm columns

This liner is identical to A100128 but is for use with 0.53 mm id columns. Liner can not be used with LINEX. Pack size: 5

P/No A100126, Fritted liner, frit on 20 mm with single taper

This liner contains a medium porosity frit made from sintered, deactivated glass. It can be used for hot and cold split and splitless injections. In addition, if used with a suitable packing material the liner can be used for large volume injection, thermal desorption, solid sampling and pyrolysis applications. If packed, a bed depth of up to 25 mm can be employed and retained in place with a plug of deactivated glass or quartz wool. The taper will improve the sensitivity for trace, active samples. Pack size: 5

## *Liners for Large Volume Injections*

These standard liners have properties that are well understood and provide a reliable solution to the majority of applications. Some liners are packed with proprietary packing materials which have been especially developed for large volume injections. The use of syringe equipped with tipped, a side-hole needle is strongly recommended. It results in better liner capacity and reduced septum damage.

P/No A100060, "A" type packed liner for large volume injections

This liner contains a highly deactivated packing that combines a maximum operating temperature of 350°C with a high sample capacity (in excess of 150 µl in most cases). This liner has been found to be suitable for the following classes of compounds:

- Pesticides
- Triazine herbicides
- PAH's
- Mineral oils
- Derivatized acid herbicides
- Drugs of abuse

Pack size: 5

P/No A100095, "8270" packed liner for large volume injections

This liner contains a highly deactivated packing that combines a maximum operating temperature of 350 °C with a high sample capacity (in excess of 150µl in most cases). This liner has been developed for the EPA 8270 method. Pack size: 5

P/No A100056, Multi-Capillary Liner for large volume injection

This liner is very inert and capable of operation up to 600°C. As such, it is suitable for the large volume injection of high molecular weight compounds. The capacity of the liner is lower than that of a packed liner (25-50 µl, depending upon solvent used). To maximize sample capacity, the liner should be used in combination with a syringe fitted with a dome tipped, side-hole needle. This liner is suitable for the following applications:

High MW hydrocarbons
Pyrethroids
OCP pesticides

Pack size: 5

P/No A100106, At-Column Liner

This liner is used for the At-Column technique. The At-Column technique is a patented rapid large volume injection technique with the advantages of the on-column technique. Liner can be used with LINEX. Pack size: 5

P/No A100133, Sintered Glass Liner with taper

This liner is both very inert and capable of operation to 600°C. As such it is suitable for the large volume injection of high molecular weight compounds. The capacity of the liner is lower than that of a packed liner (about 50 µl, depending upon solvent used). To maximize the sample capacity, the liner should be used in combination with a syringe fitted with a dome tipped, side-hole needle. Pack size: 5

## *LINEX-DMI Liners*

P/No L100011, LINEX DMI Fritted Liner, frit at 20 mm from the bottom

This liner contains a medium porosity frit made from sintered, deactivated glass. It is used for Difficult Matrix Introduction (DMI) in combination with L100010 and D100005. This technique extends the capability of OPTIC to the analysis of dirty liquid samples containing non-volatiles and/or solid-like suspended matrix. Row sample or roughly filtered extract placed into a sample container (micro-vial, p/n D100005), which is inserted into the liner. DMI Needle Guide (p/n L100010) is used to ensure an accurate sample injection. Pack size: 5

P/No L1000010, LINEX DMI Needle Guide Straight

Syringe needle guide used in combination with L100009. Pack size: 5

P/No D100005, DMI Liner Insert (micro-vial)

This micro-vial is used as a sample container in DMI technique. It is used in combination with L100009. Pack size: 100

## *LINEX-TD Liners*

P/No L100009, Fritted Liner, frit at 20 mm from the liner bottom

This liner contains a medium porosity frit made from sintered, deactivated glass. It can be used for the LINEX direct (in-injector) thermal desorption of all kind of solid samples. If used with a suitable packing material the liner can be used for thermal desorption of gaseous samples. If packed, a bed depth of up to 25 mm can be employed and retained in place with a plug of deactivated glass or quartz wool. Pack size: 5